

REMARKS

Reconsideration and withdrawal of the rejections set forth in the Office Action dated June 22, 2004 are respectfully requested. In that Office Action, the Examiner rejected Claims 1, 4-5, 8, and 11-12 as being anticipated by U.S. Patent No. 6,632,342 to Teshima. The Examiner also rejected Claims 2-3, 6-7, 9-10 and 13-14 as being obvious in view of the Teshima reference. Specifically, the Examiner points out Figures 1A and 1B and the associated discussion in the background section of the Teshima patent. Applicant specifically requests reconsideration.

The present invention relates to an image sensor that has a micro-lens array for focusing incident light onto a pixel. In a typical image sensor pixel array, a series of rows and columns are provided to form a two dimensional array. Micro-lens are formed over each of the pixels in order to focus light onto the pixel. However, because of certain lens characteristics (further described in the specification), the peripheral regions of the image sensor exhibit "darkness" relative to those pixels in the center of the image array. In order to compensate for this, in accordance with the present invention, the micro-lens array is purposefully partitioned into an inner portion and an outer portion. The outer portion has micro-lenses that are intentionally made larger and/or taller than the micro-lenses in the inner portion of the pixel array. By including larger micro-lenses in the outer portions of the micro-lens array, greater focusing of light can be obtained in the outer portion of the image sensor, thereby compensating for darkness in the outer portion of the image sensor.

The Teshima reference relates to a method for fabricating a microstructure array. In particular, the Teshima patent teaches a method for fabricating a mold that is used for forming a micro-lens array. Specifically, at column 3, lines 18-48, there is described a method for forming a micro-lens using an electroplating technique. In this technique, an insulating film with a conductive layer is used. Electroplating is formed with the conductive layer acting as a cathode and a protruding portion acting as a mold for a lens. The description then goes on to state that there is an undesirable radius variation of plated layers 105 formed in a two dimensional array on the substrate 101. See Figures 1A and 1B.

The Teshima patent goes on to state that due to variations in the electroplating current density, there is an undesirable variation in the size of the microstructures 105. In other words, the prior art teaches that one undesirable effect of using an electroplating method is that the

micro-lenses have a size that varies over the array. Because this is an undesirable phenomena, Teshima then proceeds to teach a method by which the micro-lenses are all made of uniform shape. Thus, Teshima teaches that a variation in micro-lenses shape and size is an unwanted by-product of inferior manufacturing processes.


In contrast, the present claimed invention **purposefully** makes the micro-lenses larger and/or taller at the periphery of an image sensor. This is performed to combat the relative darkness of pixels at the periphery of an image sensor. Thus the inventive aspects of the present invention are two-fold: first recognizing the possibility of correcting the dark corner phenomena by use of larger micro-lenses, and secondly purposefully forming larger micro-lenses in order to solve the problem. In contrast, the Teshima patent teaches that differing sized micro-lenses are detrimental to the performance of an image sensor. The claims have been amended so as to clarify the point that the micro-lenses are **purposefully** made to be larger in the periphery. Clearly, the Teshima patent does not teach this limitation.

In view of the foregoing, the claims pending in the application comply with the requirements of 35 U.S.C. § 112 and patentably define over the applied art. A Notice of Allowance is, therefore, respectfully requested. If the Examiner has any questions or believes a telephone conference would expedite prosecution of this application, the Examiner is encouraged to call the undersigned at (206) 359-8000.

Respectfully submitted,

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